**SYNOPSIS**

**Project Group No:** B4

**Register No: Names:**

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**Project Title**: Vision-Based Object Detection and Distance Calculation in Autonomous Vehicles

**Name of the Guide:** Dr. G Revathy/AP-III/CSE/SRC/SASTRA

**Abstract**

Object detection and distance estimation are key technologies for enabling autonomous systems to navigate and interact with their environments effectively. This project is aimed at developing and testing algorithms for simultaneous object detection and distance estimation in indoor autonomous vehicles. The proposed method will utilize YOLOv5 and its variants, as well as YOLOv8 and SSD models, for obstacle detection and distance estimation with a single monocular camera, without requiring further calibration. Training will be performed on a combination of existing datasets, such as KITTI, and a custom-labelled indoor environment dataset. Data augmentation and transfer learning techniques will be used to improve model performance and adaptability. The project will compare and evaluate these methods in order to provide a reliable and cost-effective solution for the accurate detection of obstacles and distance estimation in indoor environments**.**

**Specific Contribution:**

**KURUBA BHAVYASREE**: She focused on implementing YOLOv5 (s and l variants) and YOLOv8n for object detection in indoor environments. She was involved in training, validation, and evaluation of these models. Additionally, she developed a hybrid detection pipeline combining YOLOv5 and YOLOv8 outputs using datasets to enhance accuracy and contributed significantly to annotating and augmenting the custom dataset.

**SOWMIYA G:** She implemented the YOLOv5n and SSD models for object detection and evaluated their performance on KITTI dataset. She was actively involved in training, validation, and performance analysis of both models. Her work also included visualizing detection outputs and integrating them with simulated distance estimation.

**MANTHRA P M:** She implemented the YOLOv5m model and assisted in SSD and hybrid model integration for object detection. She was actively involved in training, validation, and performance analysis and actively contributed to collecting the custom outdoor dataset.

**Specific Learning:**

**KURUBA BHAVYASREE:** Gained practical expertise in YOLOv5 (s, l) and YOLOv8 model training, inference, and evaluation. Developed skills in object detection pipeline integration and annotation handling. Strengthened knowledge in performance metric analysis and hybrid model fusion techniques.

**SOWMIYA G:** Acquired knowledge in training and optimizing YOLOv5m and SSD models. Improved understanding of model comparison, bounding box evaluation, and mAP-based performance tuning.

**MANTHRA P M:** Learned custom dataset collection and preprocessing for outdoor environments. Gained experience in YOLOv5m model deployment and hybrid model experimentation.

**Technical Limitations & Ethical Challenges faced:** accuracy can decrease in poor lighting or occluded scenes. Misuse of the system for surveillance or privacy invasion raises concerns about data security and consent.

Keywords: object detection, YOLO, SSD, distance estimation, autonomous vehicles

**Signature of the Student Signature of Guide**

**Date:**